FIG. 1

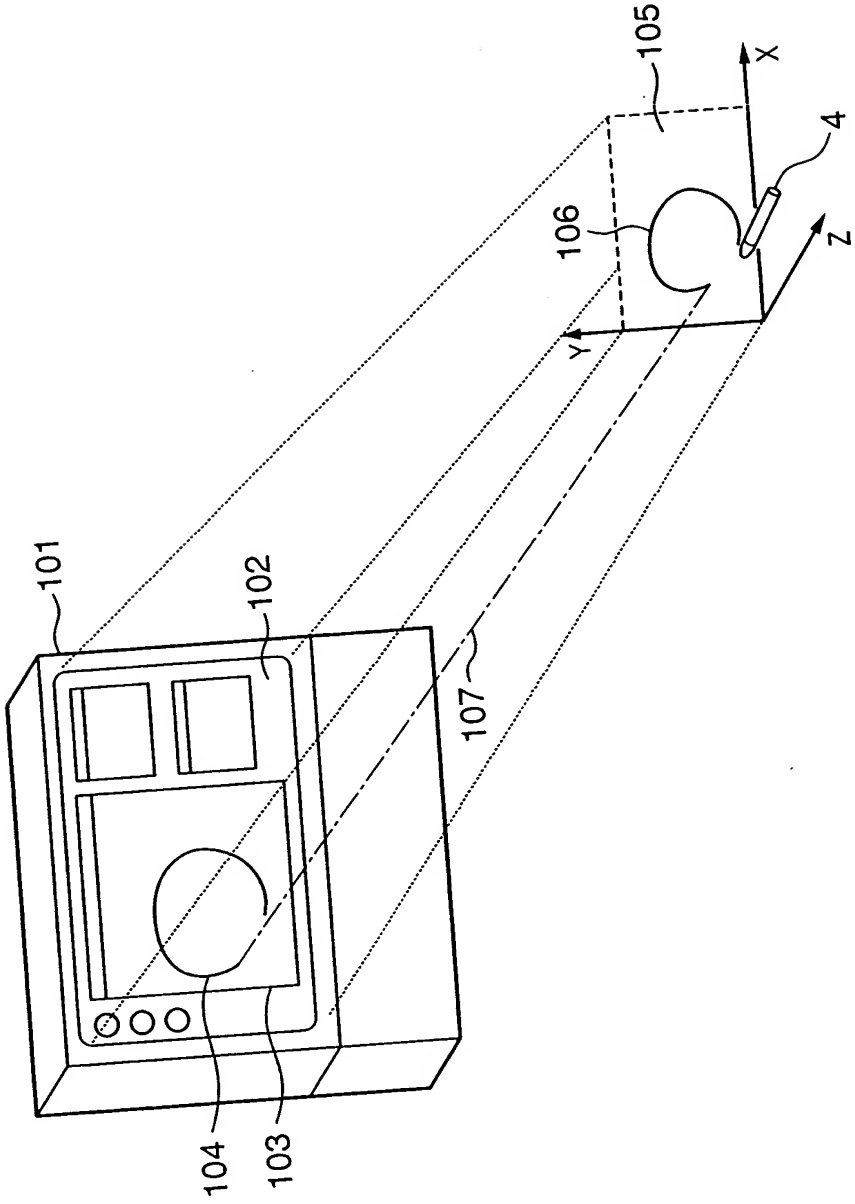


FIG. 2A

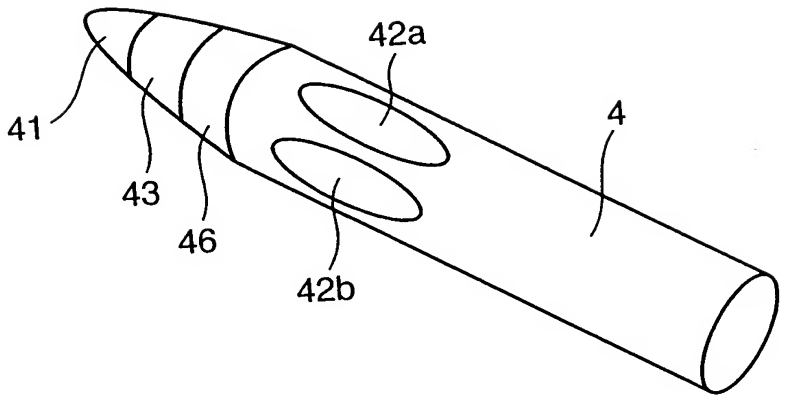


FIG. 2B

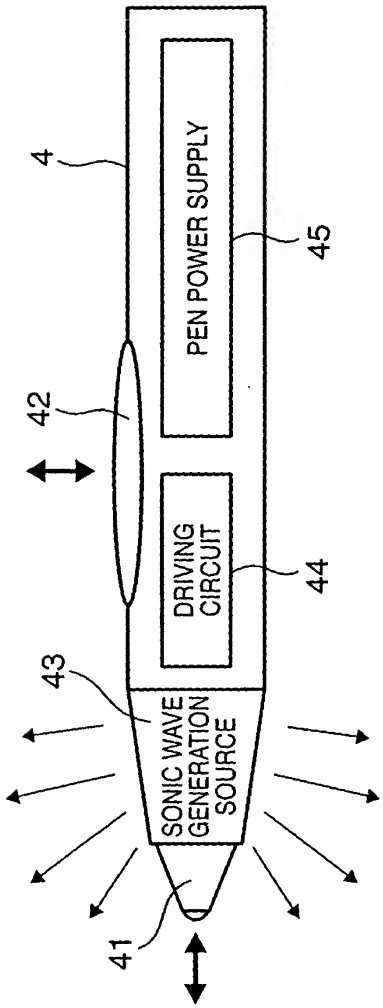

4
PEN POWER SUPPLY
45
42
DRIVING CIRCUIT
44
43
SONIC WAVE GENERATION SOURCE
41

FIG. 3

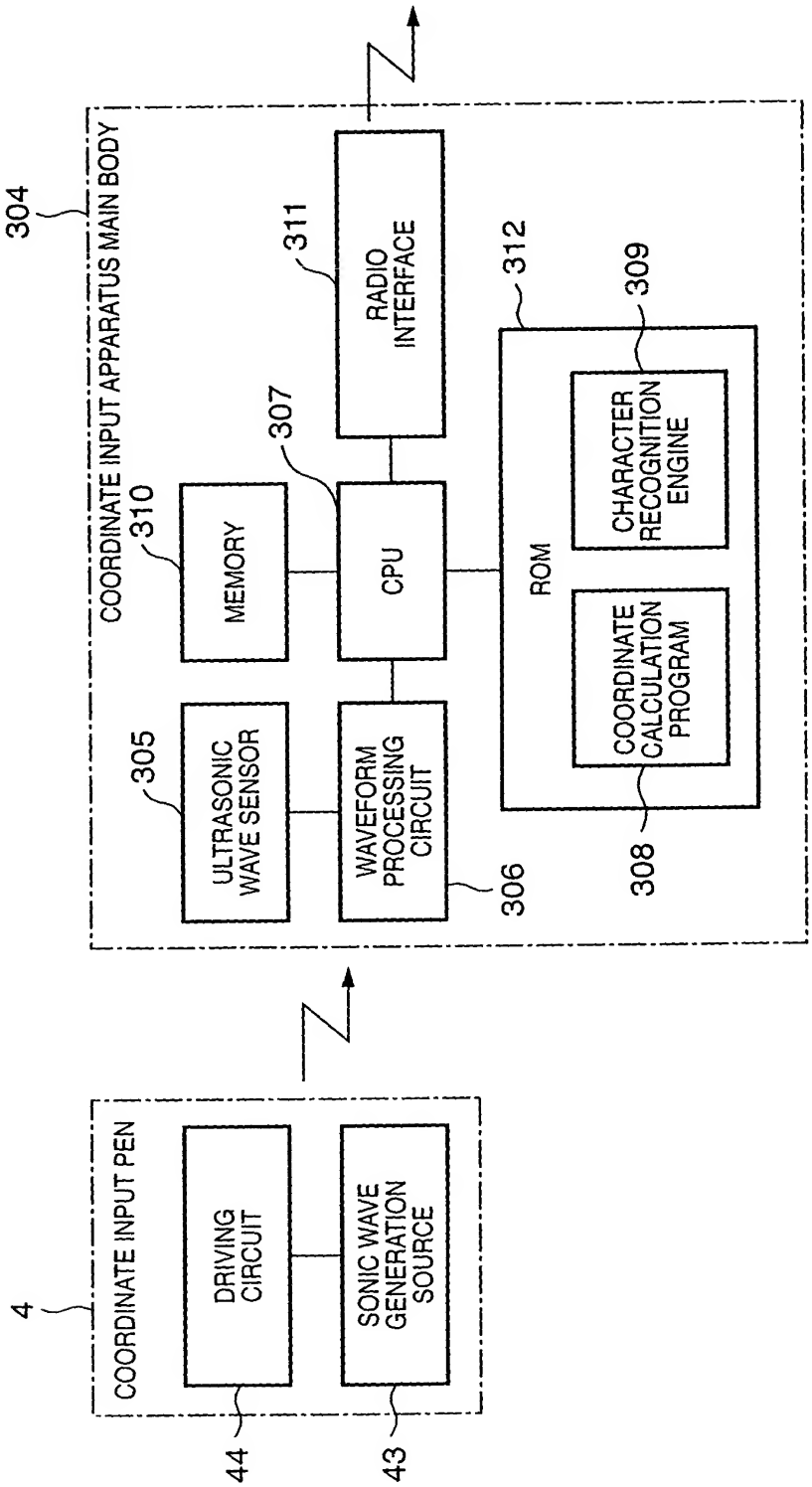

4
COORDINATE INPUT PEN
DRIVING CIRCUIT
SONIC WAVE GENERATION SOURCE
44
43
304
COORDINATE INPUT APPARATUS MAIN BODY
305
ULTRASONIC WAVE SENSOR
WAVEFORM PROCESSING CIRCUIT
306
310
MEMORY
307
CPU
311
RADIO INTERFACE
312
ROM
309
CHARACTER RECOGNITION ENGINE
COORDINATE CALCULATION PROGRAM
308

FIG. 4

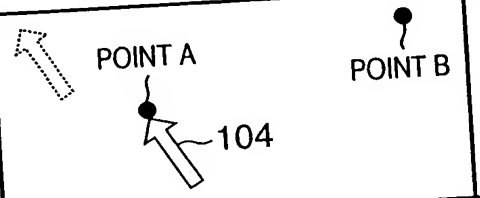
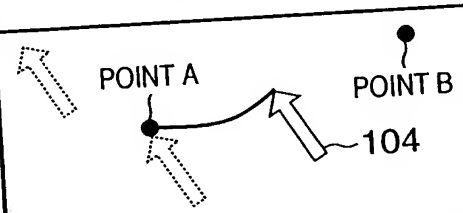
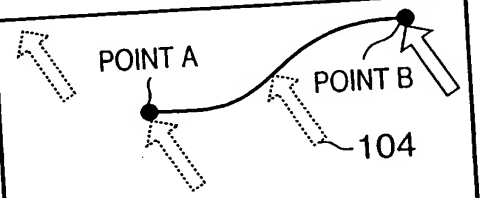
	CURSOR ON SCREEN	STATE OF PEN (SCREEN STATE)	PEN SIDE SWITCH : STATE
1		STOP (CURSOR STOP)	SWITCH42a : OFF SWITCH42b : OFF
2		OSCILLATION (CURSOR MOVEMENT)	SWITCH42a : ON SWITCH42b : OFF
3		OSCILLATION (DRAW)	SWITCH42a : ON SWITCH42b : ON
4		STOP (CURSOR STOP)	SWITCH42a : OFF SWITCH42b : OFF

FIG. 5

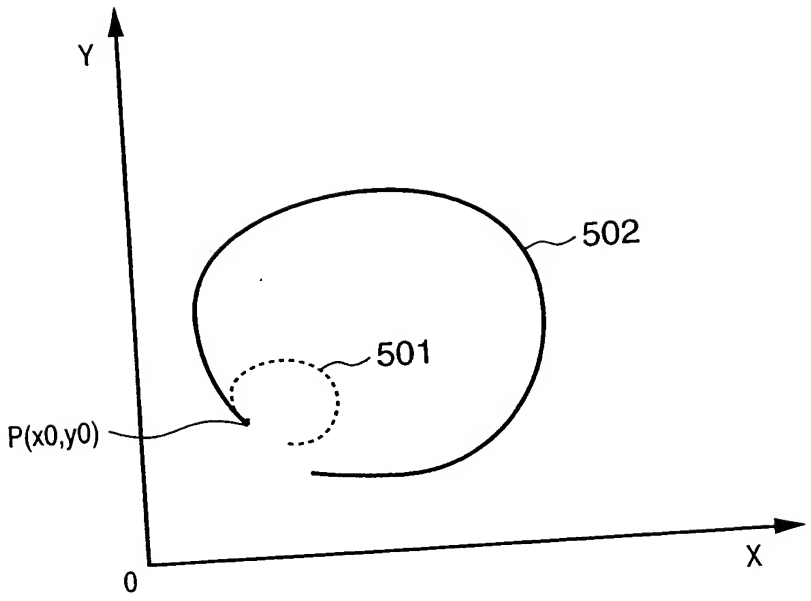


FIG. 6

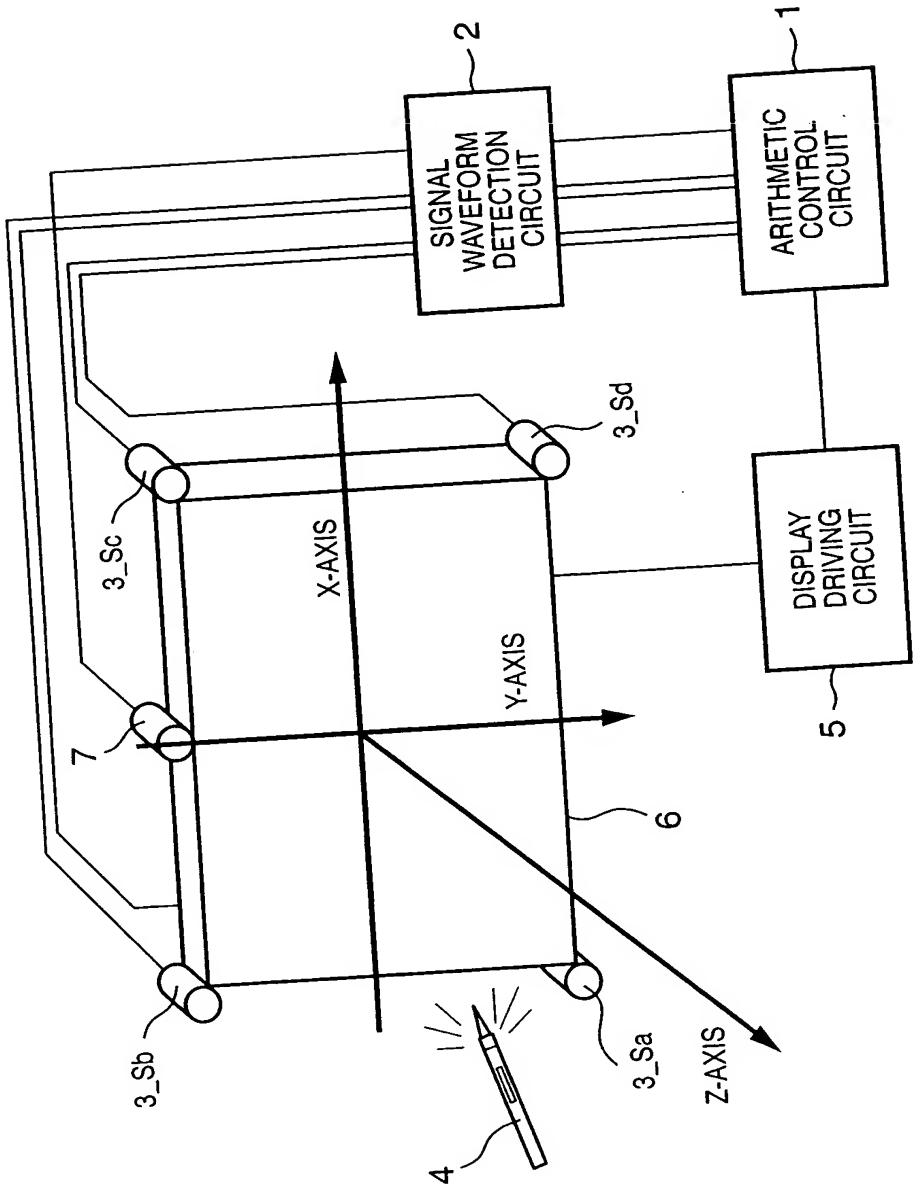

2
SIGNAL WAVEFORM DETECTION CIRCUIT
1
ARITHMETIC CONTROL CIRCUIT
3_Sd
3_Sc
X-AXIS
Y-AXIS
DISPLAY DRIVING CIRCUIT
5
7
6
3_Sb
3_Sa
Z-AXIS
4

FIG. 7

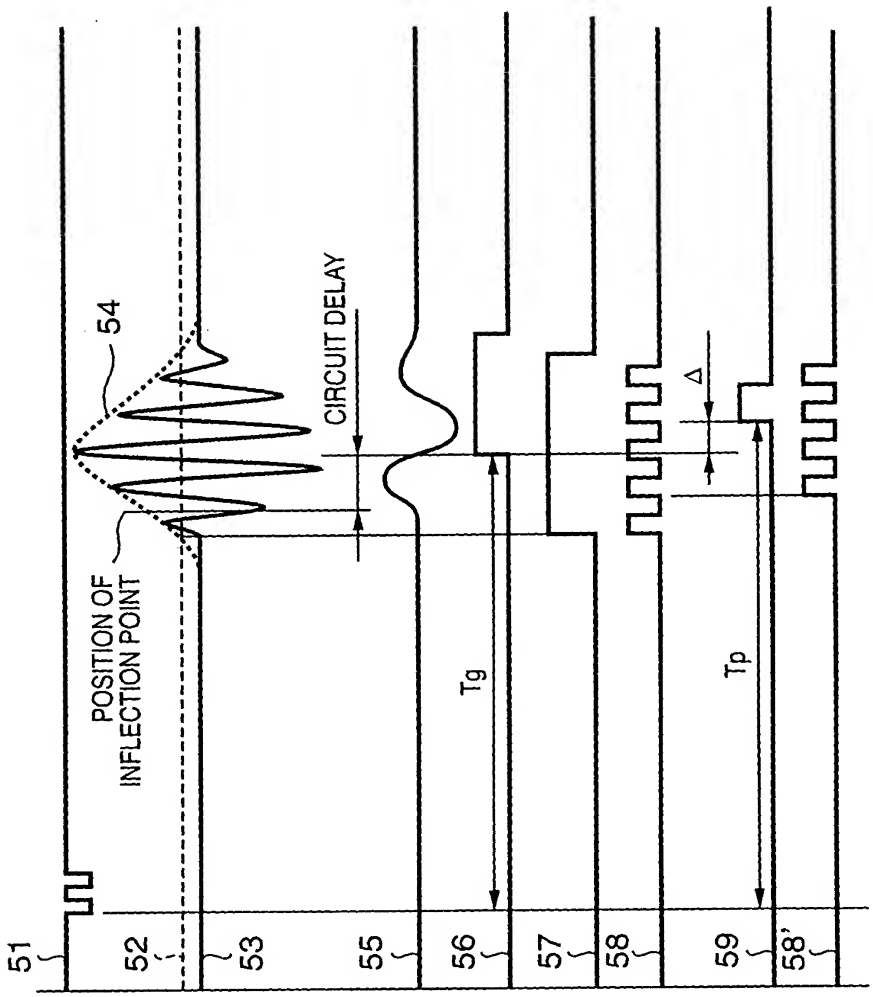

51
52
53
54
55
56
57
58
59
58'
POSITION OF INFLECTION POINT
CIRCUIT DELAY
Tg
Tp
Δ

FIG. 8

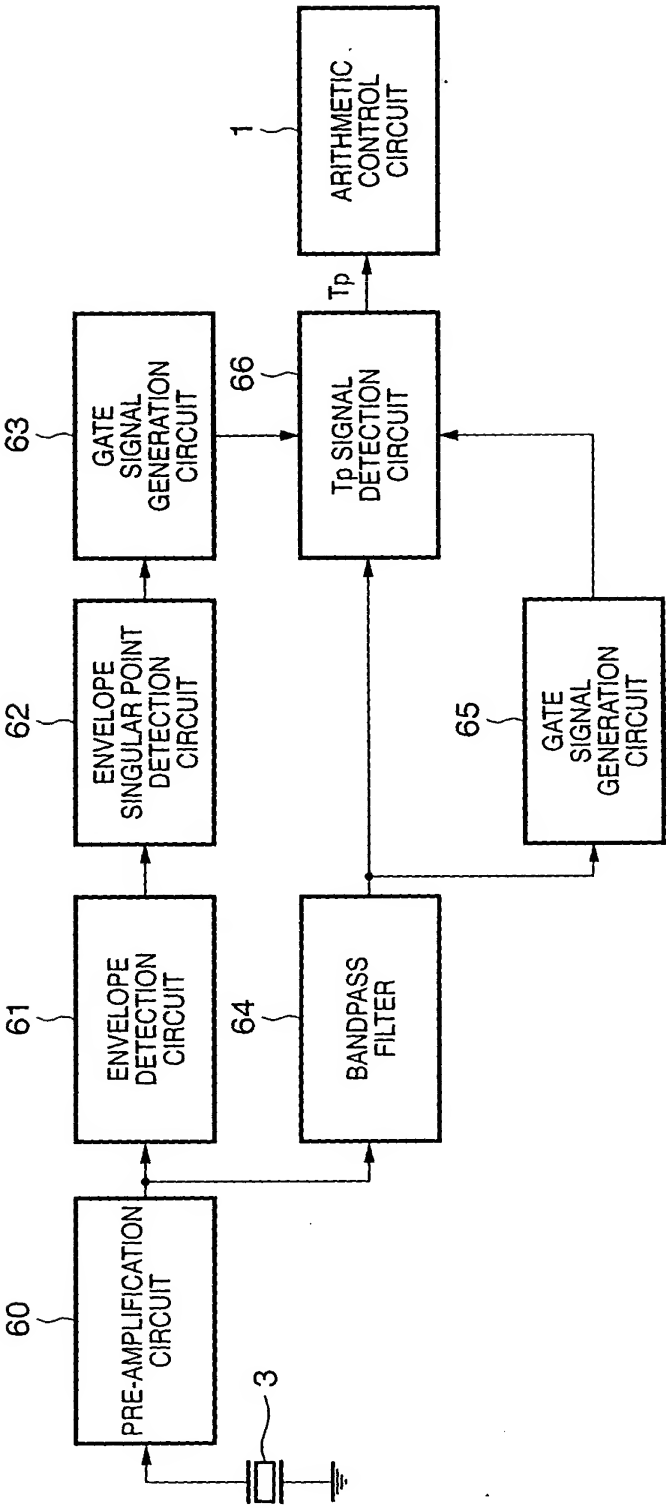

1
ARITHMETIC CONTROL CIRCUIT
Tp
66
Tp SIGNAL DETECTION CIRCUIT
63
GATE SIGNAL GENERATION CIRCUIT
62
ENVELOPE SINGULAR POINT DETECTION CIRCUIT
61
ENVELOPE DETECTION CIRCUIT
60
PRE-AMPLIFICATION CIRCUIT
64
BANDPASS FILTER
65
GATE SIGNAL GENERATION CIRCUIT
3

FIG. 9

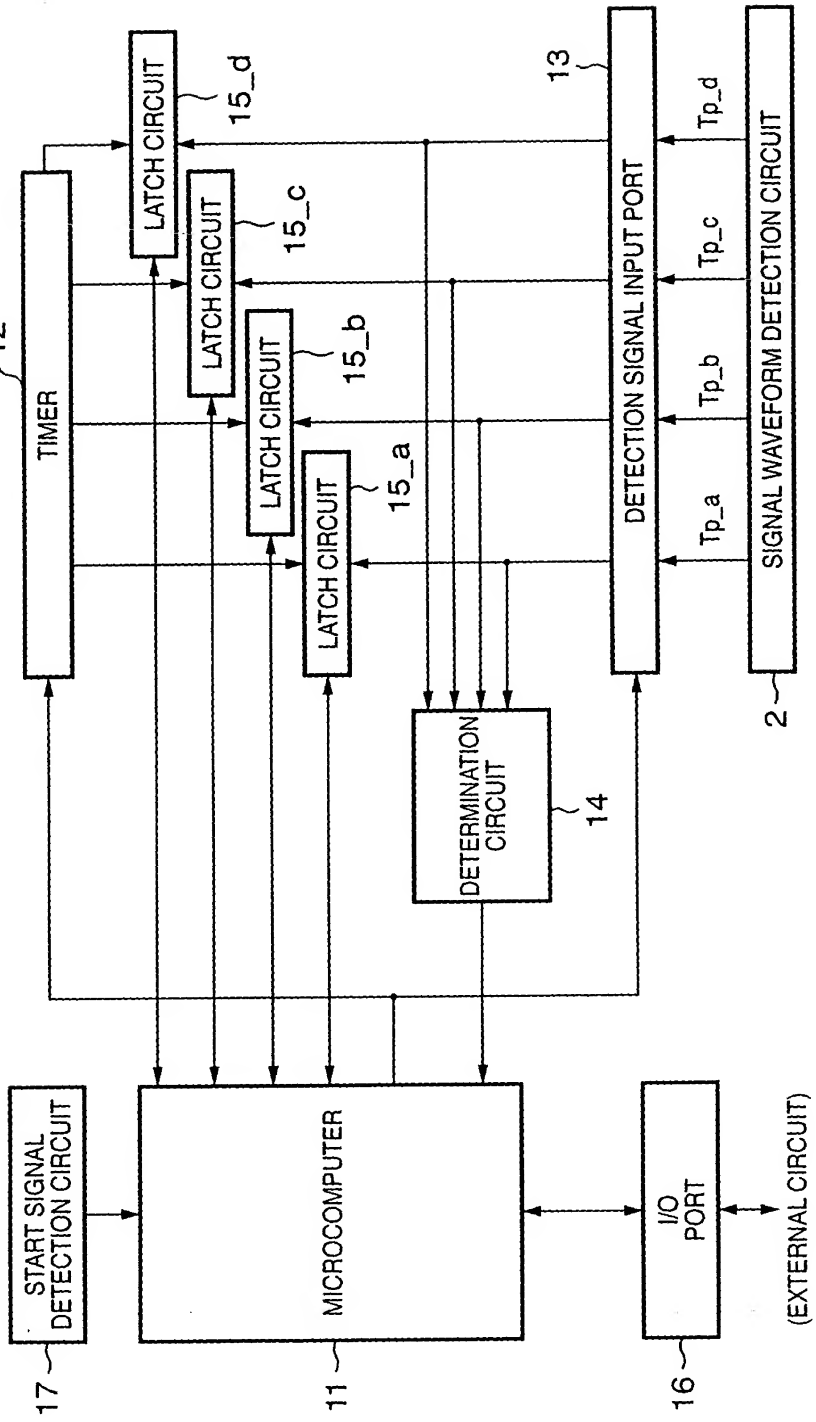

START SIGNAL DETECTION CIRCUIT
17
MICROCOMPUTER
11
I/O PORT
16
(EXTERNAL CIRCUIT)
TIMER
12
LATCH CIRCUIT
15_a
LATCH CIRCUIT
15_b
LATCH CIRCUIT
15_c
LATCH CIRCUIT
15_d
DETERMINATION CIRCUIT
14
DETECTION SIGNAL INPUT PORT
13
SIGNAL WAVEFORM DETECTION CIRCUIT
2
Tp_a
Tp_b
Tp_c
Tp_d

FIG. 10

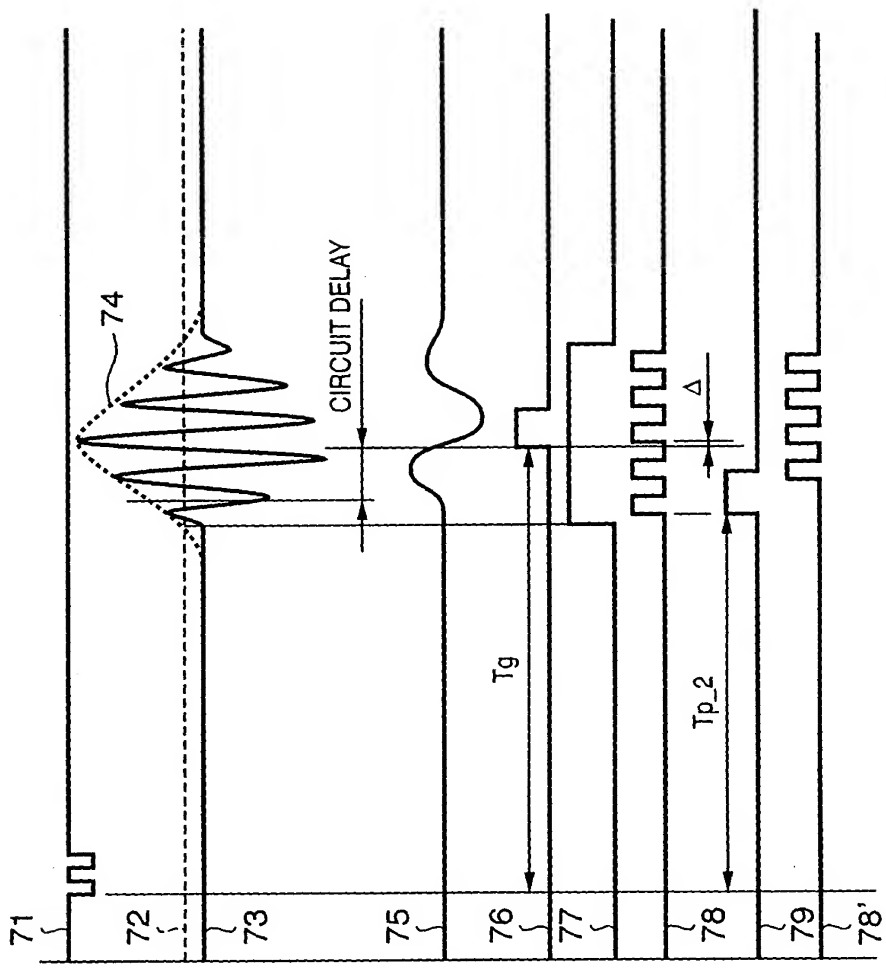


FIG. 11

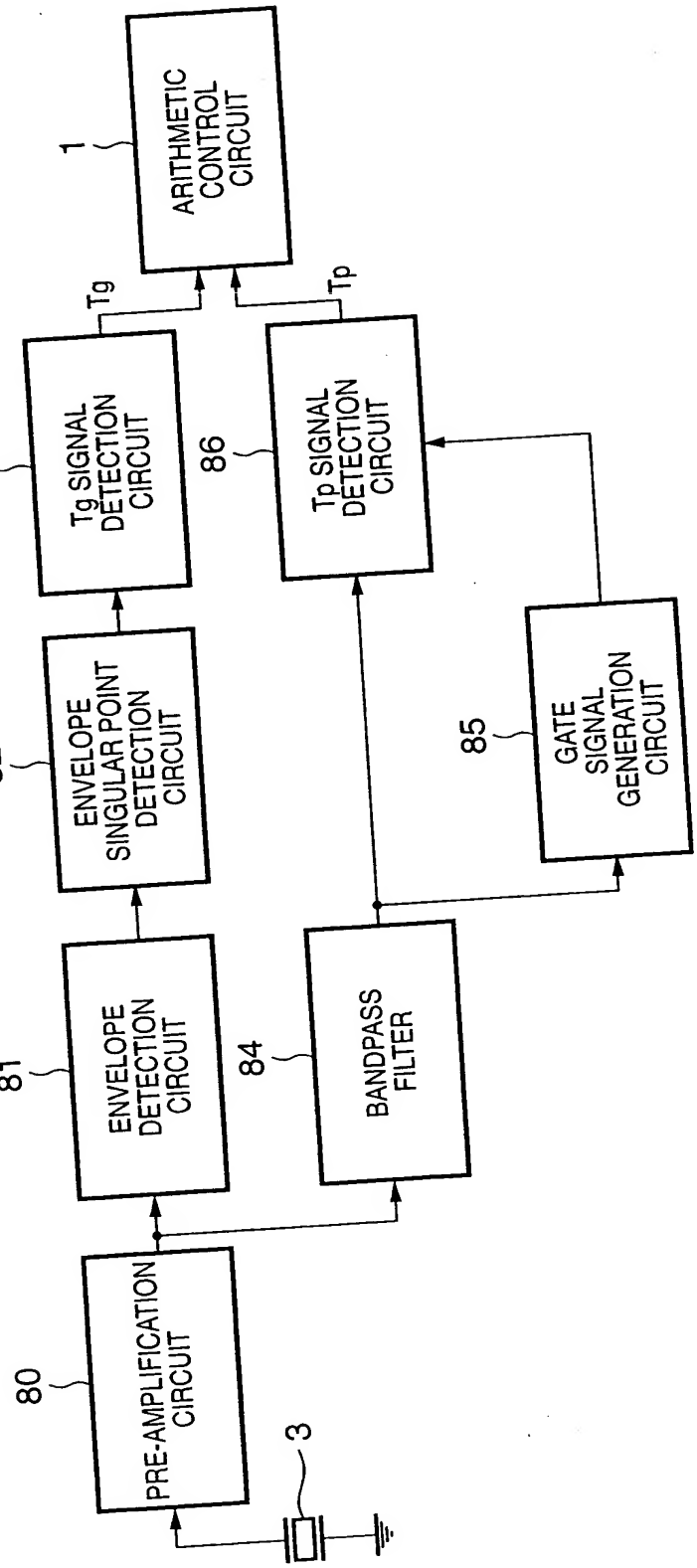

ARITHMETIC CONTROL CIRCUIT
1
Tg
Tp
Tg SIGNAL DETECTION CIRCUIT
87
Tp SIGNAL DETECTION CIRCUIT
86
ENVELOPE SINGULAR POINT DETECTION CIRCUIT
82
GATE SIGNAL GENERATION CIRCUIT
85
ENVELOPE DETECTION CIRCUIT
81
BANDPASS FILTER
84
PRE-AMPLIFICATION CIRCUIT
80
3

FIG. 12

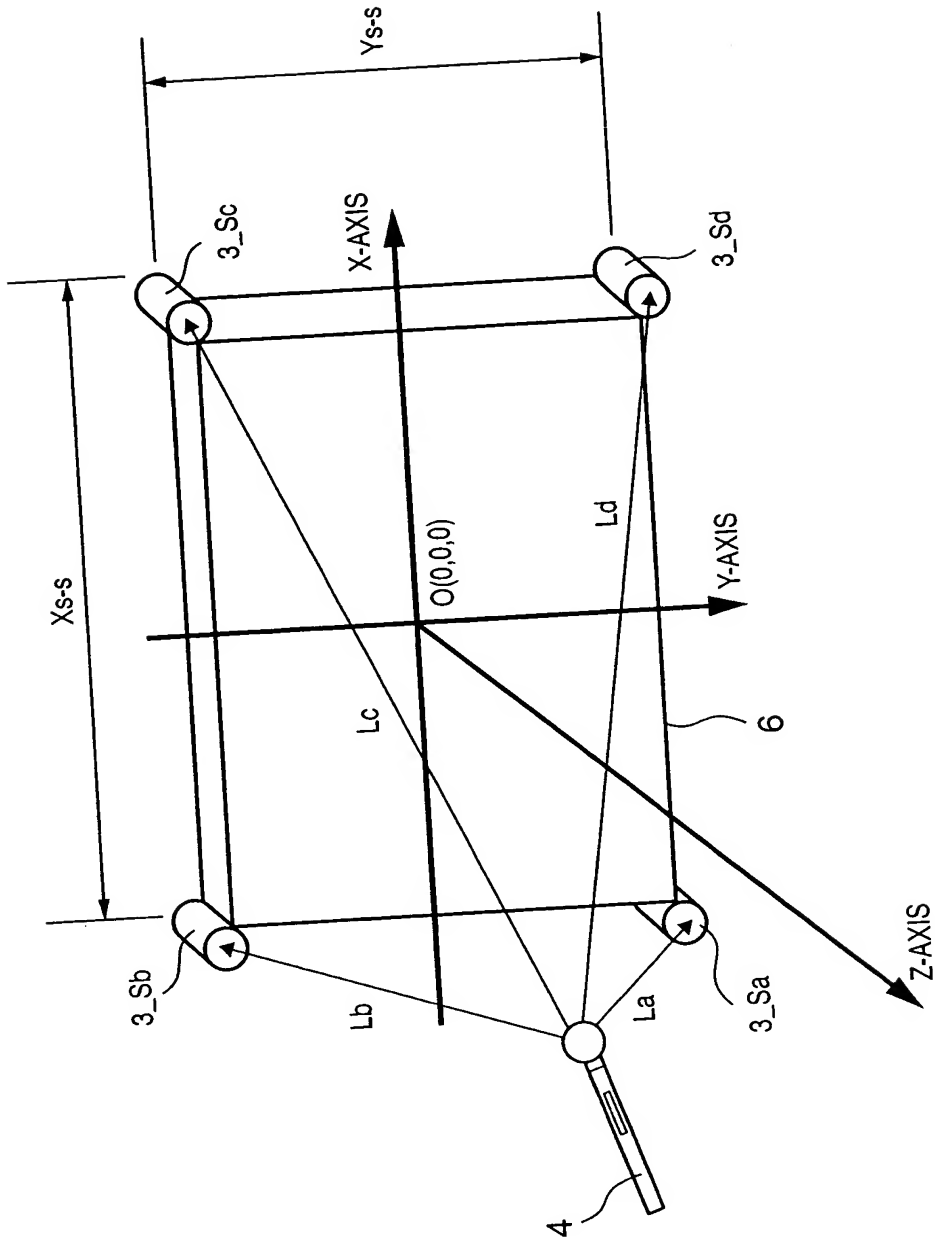


FIG. 13

PEN					MAIN BODY		
OPERATION MODE	SW41	SW42a	SW42b	DRIVING INTERVAL (T)	OUTPUT COORDINATE MODE	Z-AXIS DIRECTION COORDINATE VALUES	RELATIVE COORDINATES ΔXΔY, MAGNIFICATION k_n
PEN INPUT (Mode=1)	ON	OFF	OFF	T1	ABSOLUTE COORDINATES	50 mm OR LESS	
PROXIMITY INPUT (Mode=2)	ON→OFF	OFF	OFF	T11	ABSOLUTE COORDINATES	300 mm OR LESS	
REMOTE INPUT1 (Mode=3)	OFF	ON	OFF	T2	RELATIVE COORDINATES	400 mm OR MORE	k_0
REMOTE INPUT2 (Mode=4)	OFF	ON	ON	T21	RELATIVE COORDINATES	400 mm OR MORE	k_0
REMOTE INPUT1,2 (Mode=3,4)	OFF	ON	ON or OFF	T2 or T21	RELATIVE COORDINATES	0.4 ～ 2m	k_1
REMOTE INPUT1,2 (Mode=3,4)	OFF	ON	ON or OFF	T2 or T21	RELATIVE COORDINATES	2 ～ 4m	k_2
REMOTE INPUT1,2 (Mode=3,4)	OFF	ON	ON or OFF	T2 or T21	RELATIVE COORDINATES	4 m OR MORE	k_3

FIG. 14

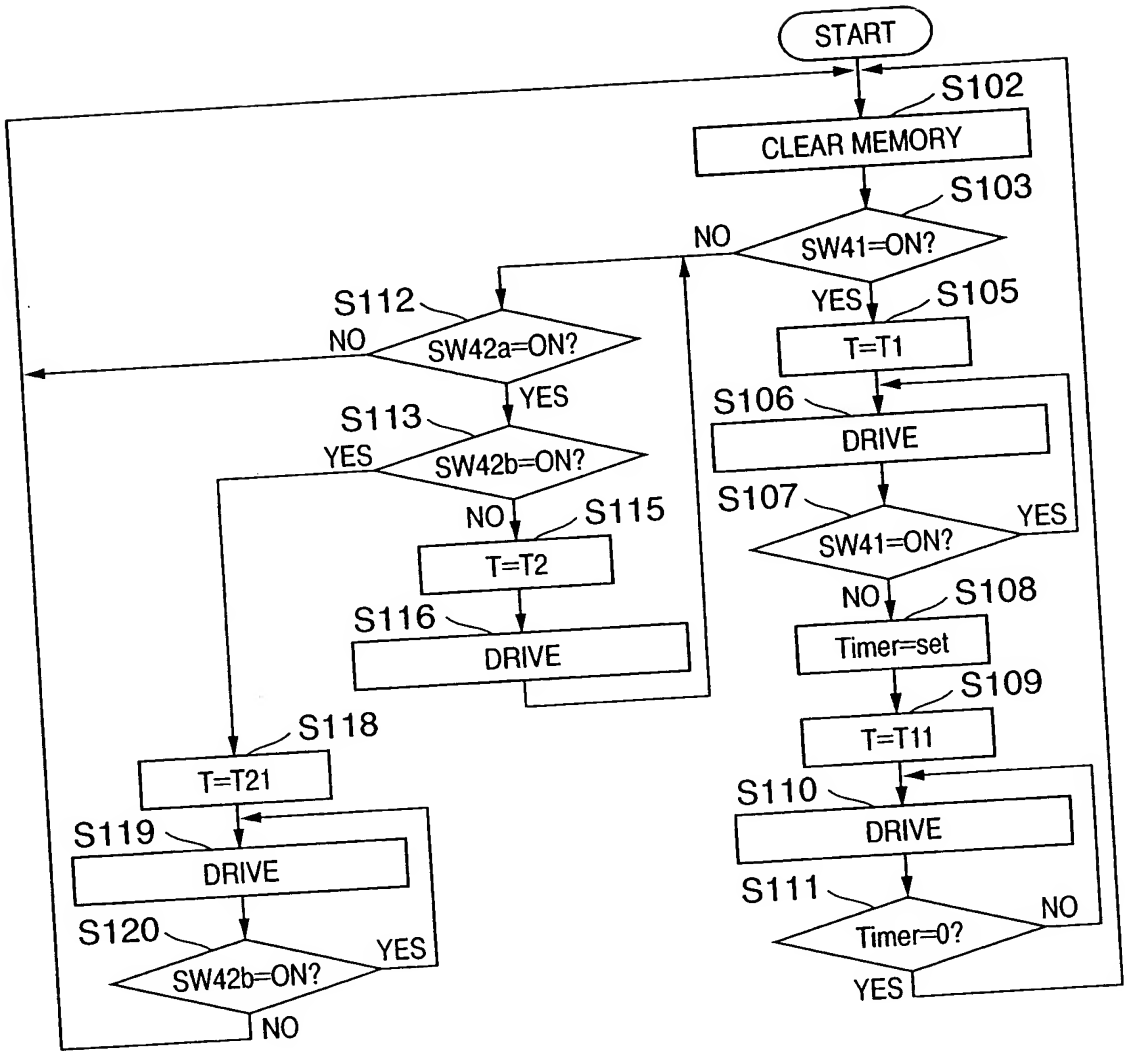

START
S102
CLEAR MEMORY
S103
SW41=ON?
NO
YES
S105
T=T1
S106
DRIVE
S107
SW41=ON?
YES
NO
S108
Timer=set
S109
T=T11
S110
DRIVE
S111
Timer=0?
NO
YES
S112
SW42a=ON?
NO
YES
S113
SW42b=ON?
YES
NO
S115
T=T2
S116
DRIVE
S118
T=T21
S119
DRIVE
S120
SW42b=ON?
YES
NO

FIG. 15

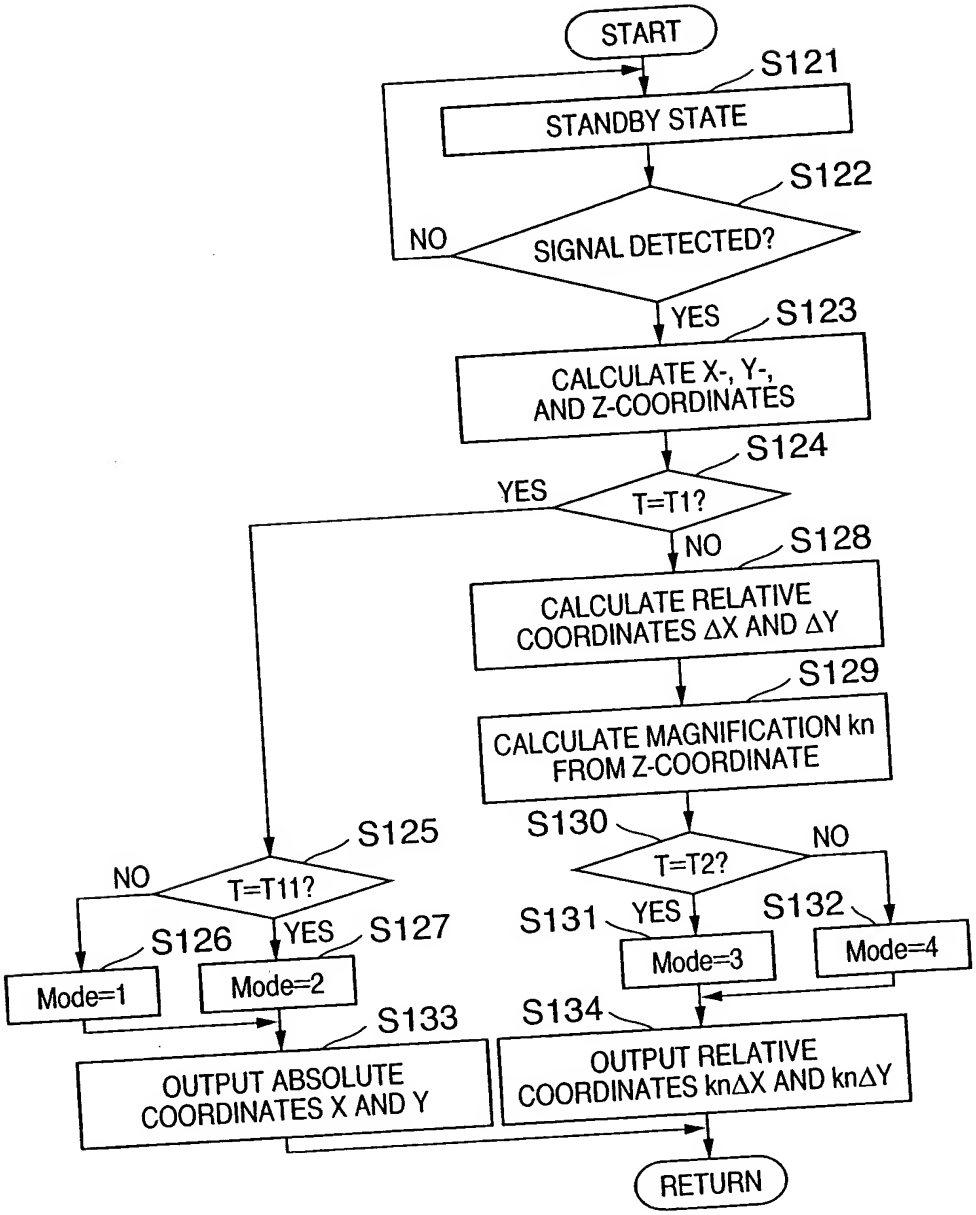

START
S121
STANDBY STATE
S122
NO
SIGNAL DETECTED?
YES
S123
CALCULATE X-, Y-, AND Z-COORDINATES
S124
YES
T=T1?
NO
S128
CALCULATE RELATIVE COORDINATES ΔX AND ΔY
S129
CALCULATE MAGNIFICATION kn FROM Z-COORDINATE
S130
T=T2?
NO
YES
S131
S132
Mode=3
Mode=4
S125
NO
T=T11?
YES
S126
S127
Mode=1
Mode=2
S133
OUTPUT ABSOLUTE COORDINATES X AND Y
S134
OUTPUT RELATIVE COORDINATES knΔX AND knΔY
RETURN

FIG. 16

PEN OPERATION MODE			PEN POINT SW41	PEN SIDE SW1 42a	PEN SIDE SW2 42b	Z-AXIS DIRECTION CALCULATED COORDINATE VALUES	OUTPUT COORDINATE VALUES	
	PEN UP	PEN DOWN					ABSOLUTE COORDINATES	RELATIVE COORDINATES
PEN INPUT	○		OFF	OFF	OFF	–	–	–
		○	ON	–	–	(0)	○	
PROXIMITY INPUT	○		OFF	ON	OFF	PREDETERMINED VALUE 1 OR LESS	○	
	○		OFF	OFF	ON	PREDETERMINED VALUE 1 OR LESS	○	
		○	OFF	ON	ON	PREDETERMINED VALUE 1 OR LESS	○	
REMOTE INPUT	○		OFF	ON	OFF	PREDETERMINED VALUE 2 OR MORE		○
	○		OFF	OFF	ON	PREDETERMINED VALUE 2 OR MORE		○
		○	OFF	ON	ON	PREDETERMINED VALUE 2 OR MORE		○

FIG. 17

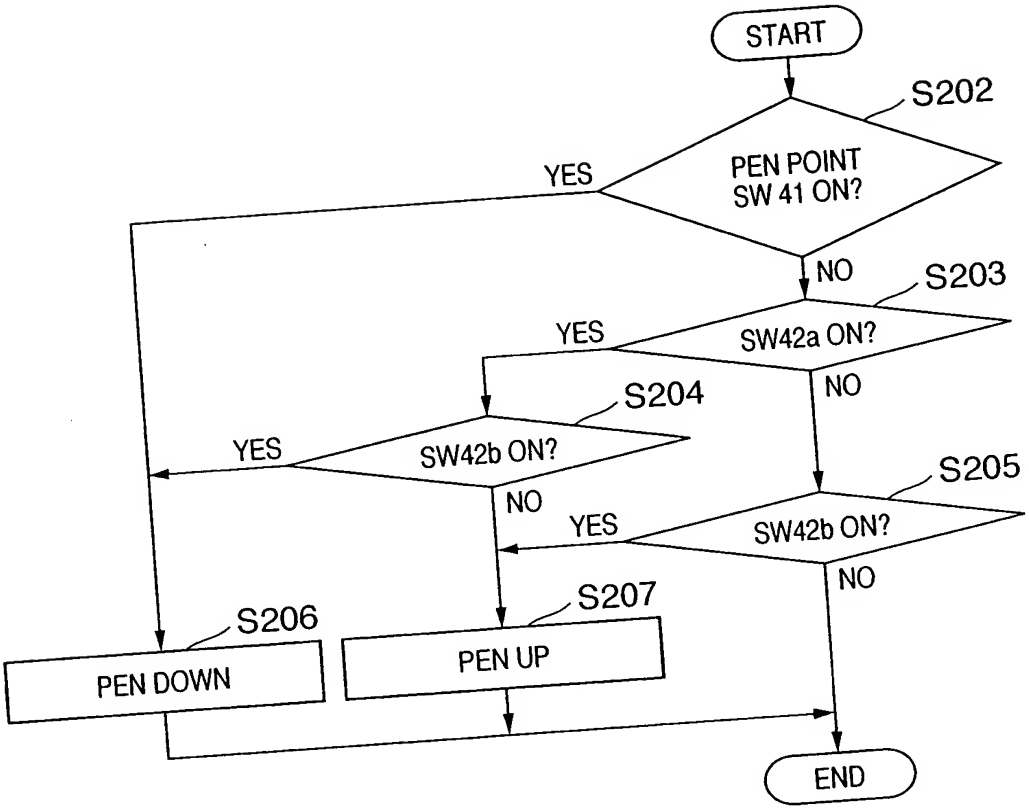

START
S202
PEN POINT SW 41 ON?
YES
NO
S203
SW42a ON?
YES
NO
S204
SW42b ON?
YES
NO
S205
SW42b ON?
YES
NO
S206
PEN DOWN
S207
PEN UP
END

FIG. 18

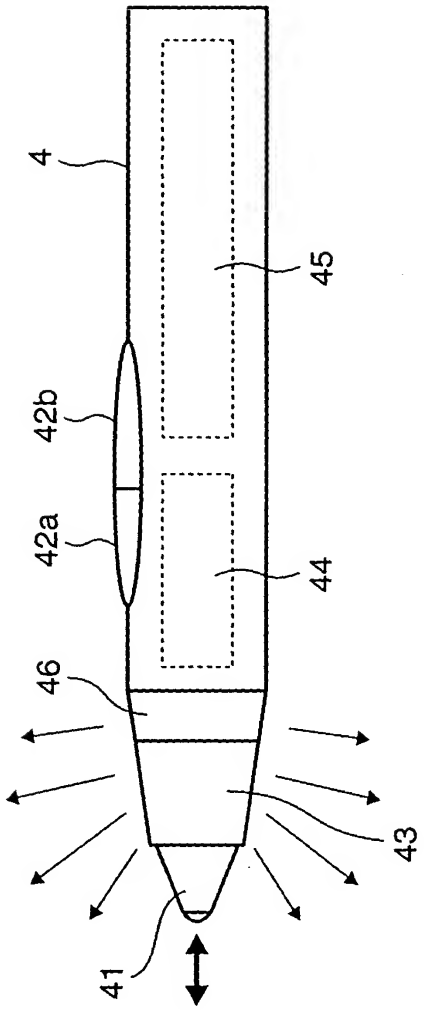


FIG. 19

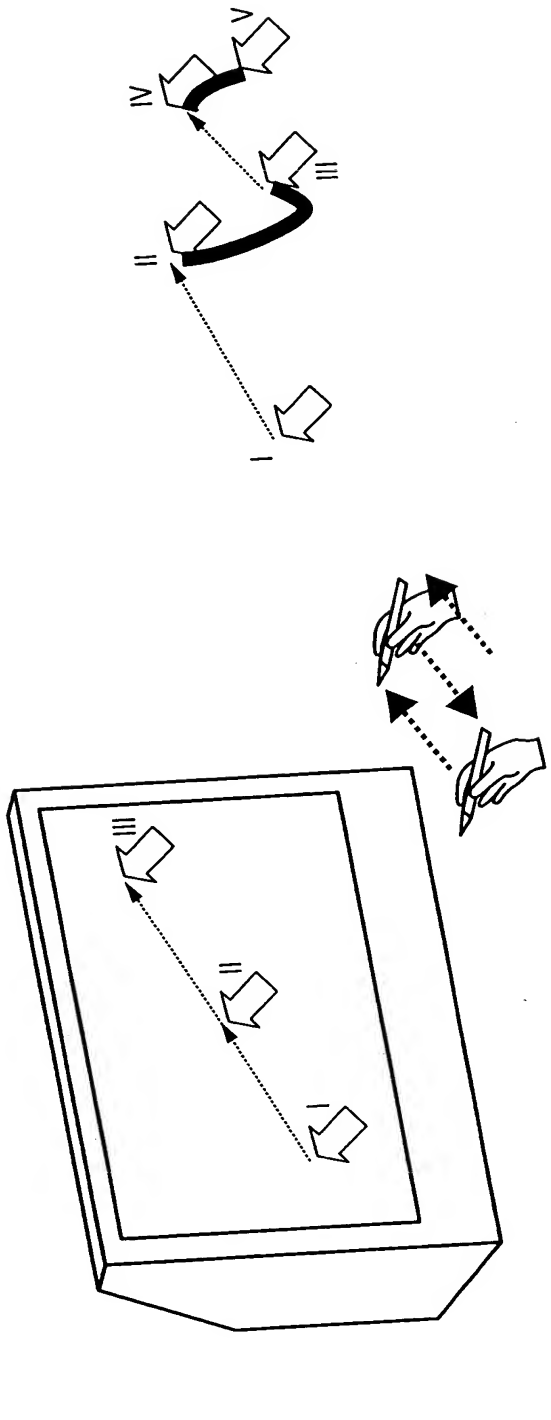


FIG. 20

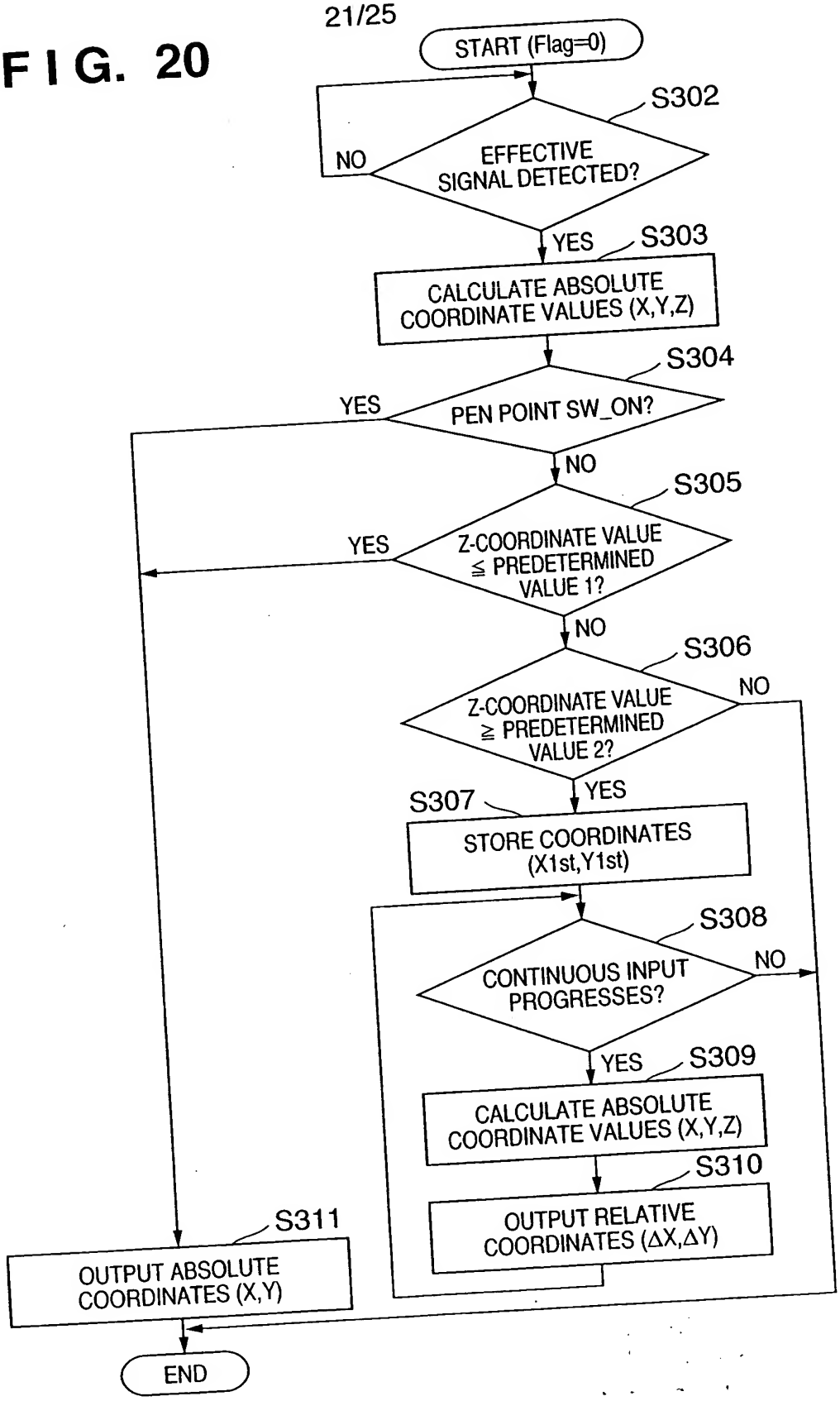

START (Flag=0)
S302
EFFECTIVE SIGNAL DETECTED?
NO
YES
S303
CALCULATE ABSOLUTE COORDINATE VALUES (X,Y,Z)
S304
PEN POINT SW_ON?
YES
NO
S305
Z-COORDINATE VALUE ≦ PREDETERMINED VALUE 1?
YES
NO
S306
Z-COORDINATE VALUE ≧ PREDETERMINED VALUE 2?
NO
YES
S307
STORE COORDINATES (X1st,Y1st)
S308
CONTINUOUS INPUT PROGRESSES?
NO
YES
S309
CALCULATE ABSOLUTE COORDINATE VALUES (X,Y,Z)
S310
OUTPUT RELATIVE COORDINATES (ΔX,ΔY)
S311
OUTPUT ABSOLUTE COORDINATES (X,Y)
END

FIG. 21

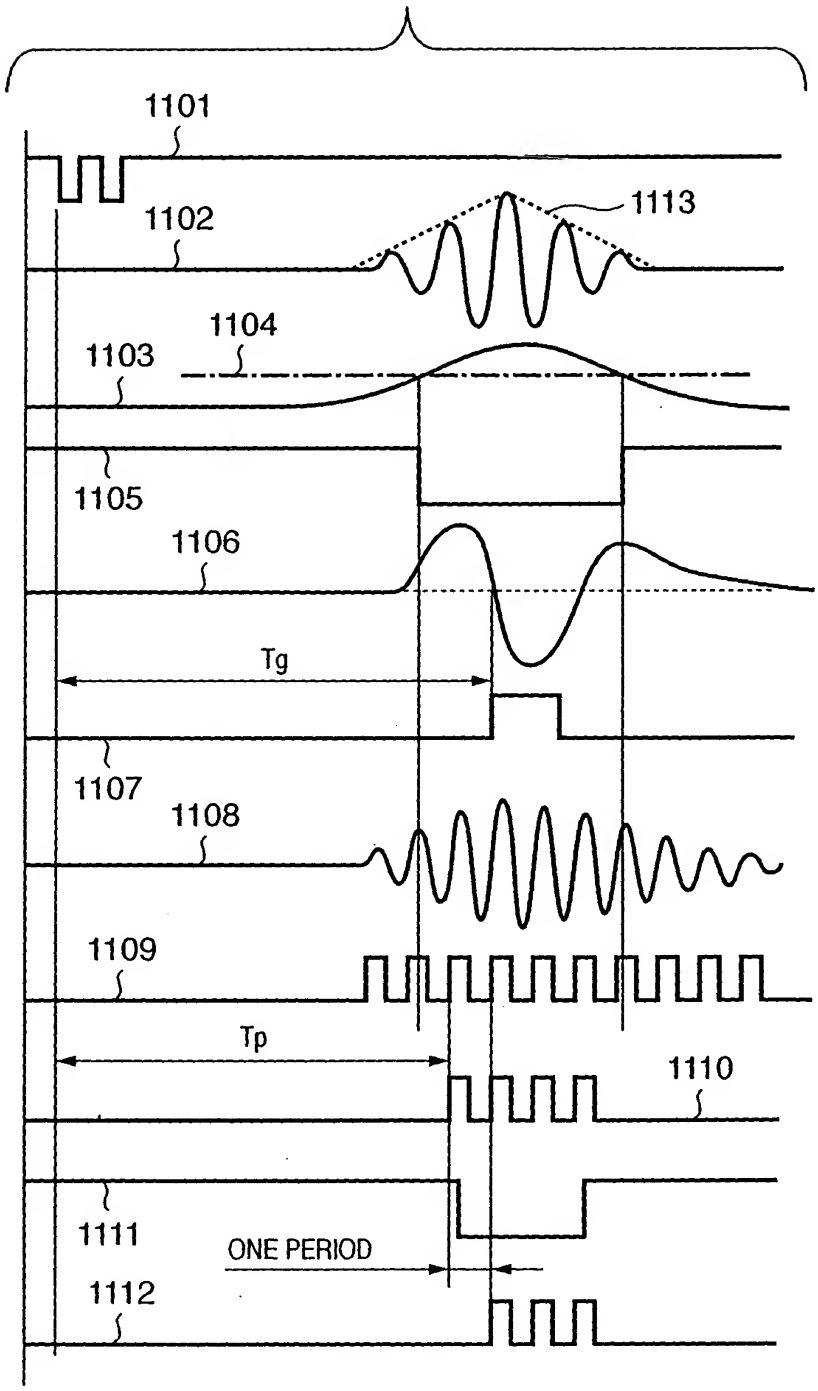

1101
1102
1113
1104
1103
1105
1106
Tg
1107
1108
1109
Tp
1110
1111
ONE PERIOD
1112

FIG. 22

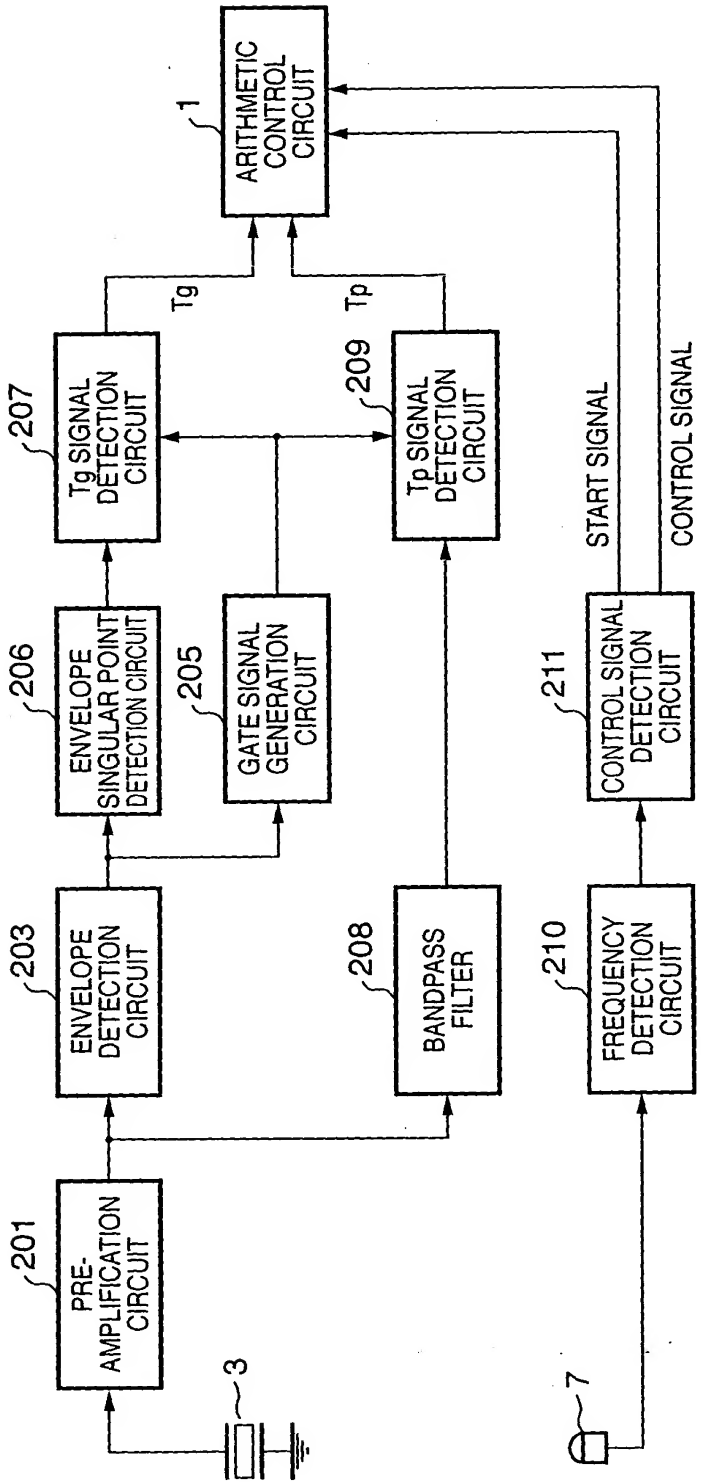

1
ARITHMETIC CONTROL CIRCUIT
Tg
Tp
207
Tg SIGNAL DETECTION CIRCUIT
209
Tp SIGNAL DETECTION CIRCUIT
START SIGNAL
CONTROL SIGNAL
206
ENVELOPE SINGULAR POINT DETECTION CIRCUIT
205
GATE SIGNAL GENERATION CIRCUIT
211
CONTROL SIGNAL DETECTION CIRCUIT
203
ENVELOPE DETECTION CIRCUIT
208
BANDPASS FILTER
210
FREQUENCY DETECTION CIRCUIT
201
PRE-AMPLIFICATION CIRCUIT
3
7

FIG. 23

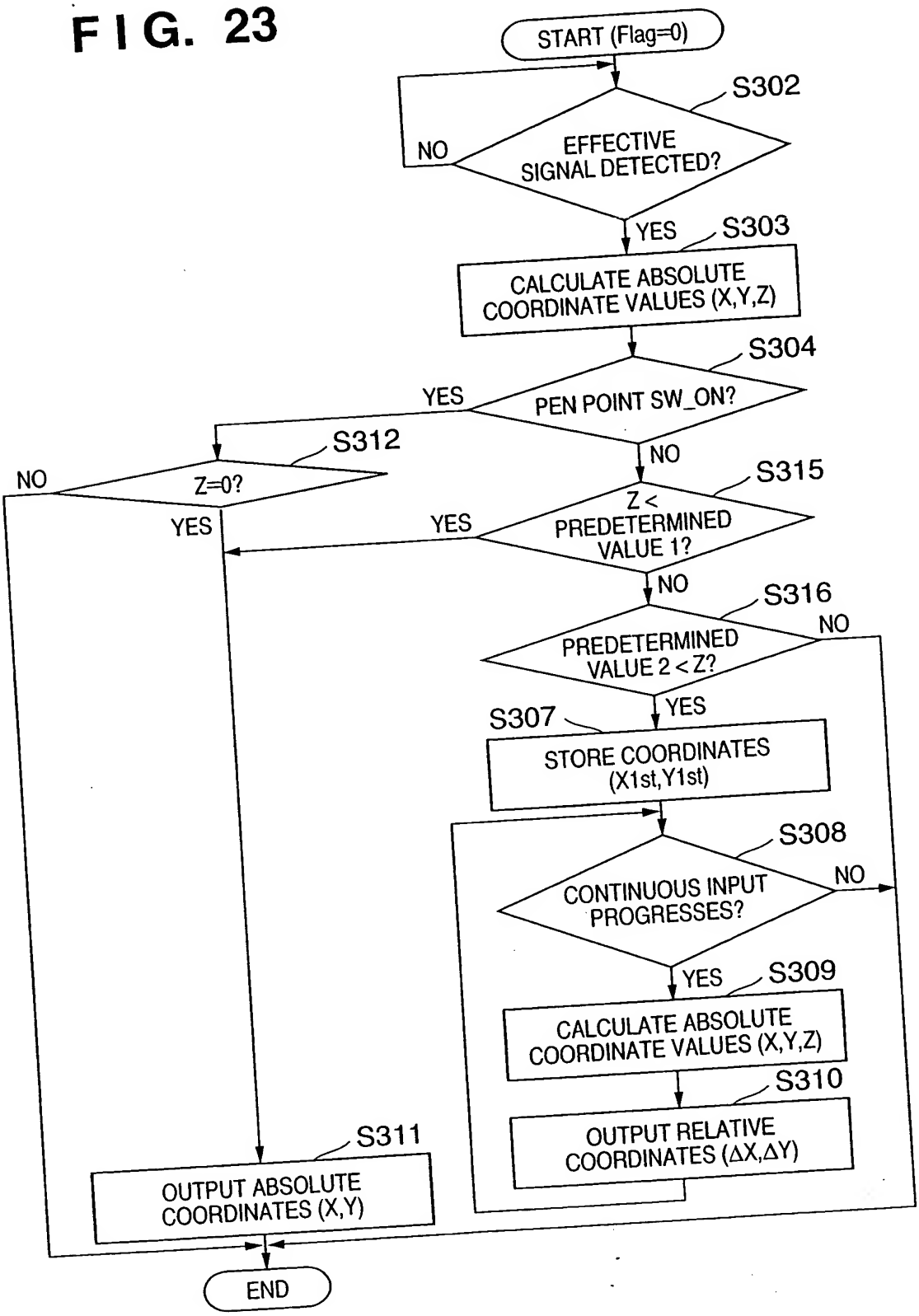

START (Flag=0)
S302
EFFECTIVE SIGNAL DETECTED?
NO
YES
S303
CALCULATE ABSOLUTE COORDINATE VALUES (X,Y,Z)
S304
PEN POINT SW_ON?
YES
NO
S312
Z=0?
NO
YES
S315
Z < PREDETERMINED VALUE 1?
YES
NO
S316
PREDETERMINED VALUE 2 < Z?
NO
YES
S307
STORE COORDINATES (X1st,Y1st)
S308
CONTINUOUS INPUT PROGRESSES?
NO
YES
S309
CALCULATE ABSOLUTE COORDINATE VALUES (X,Y,Z)
S310
OUTPUT RELATIVE COORDINATES (ΔX,ΔY)
S311
OUTPUT ABSOLUTE COORDINATES (X,Y)
END

FIG. 24

PEN OPERATION MODE			PEN POINT SW41	SW1 42a	SW2 42b	Z-AXIS DIRECTION CALCULATED COORDINATE VALUES	COORDINATE EFFECTIVE	OUTPUT COORDINATE VALUES	
	PEN UP	PEN DOWN						ABSOLUTE COORDINATES	RELATIVE COORDINATES
PEN INPUT	○		OFF	OFF	OFF	–	–	–	–
		○	ON	–	–	Z=0	○	○	
PROXIMITY INPUT	–	–	ON	–	–	0<Z<PREDETERMINED VALUE1	×	–	–
	○		OFF	ON	OFF	0<Z<PREDETERMINED VALUE1	○	○	
	○		OFF	OFF	ON	0<Z<PREDETERMINED VALUE1	○	○	
		○	OFF	ON	ON	0<Z<PREDETERMINED VALUE1	○	○	
REMOTE INPUT	–	–	ON	–	–	PREDETERMINED VALUE2<Z	×	–	–
	○		OFF	ON	OFF	PREDETERMINED VALUE2<Z	○		○
	○		OFF	OFF	ON	PREDETERMINED VALUE2<Z	○		○
		○	OFF	ON	ON	PREDETERMINED VALUE2<Z	○		○